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The Effect of Rehabilitation Exercises Accompanied by Ultrasound Waves on Improving the Range of Motion in Swimmers Suffering from Shoulder Impingement Syndrome

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Abstract

The research aims to develop rehabilitative exercises using ultrasound for swimmers suffering from shoulder impingement syndrome, and to explore the effects of these rehabilitative exercises on improving the range of motion in swimmers afflicted with this syndrome. The researchers hypothesize that there are statistically significant differences between the pre-test and post-test results of the rehabilitation of swimmers with shoulder impingement syndrome in favor of the post-test results for the experimental group. The experimental method relied on a sample of swimmers suffering from shoulder impingement syndrome, totaling seven individuals, representing 77.78% of their population, which consisted of male swimmers with Type I shoulder impingement syndrome from various local clubs in Basra, Iraq, for the sports season of 2022/2023. These individuals frequented the physical therapy department at Basra General Teaching Hospital. After diagnosis and the determination of tests, exercises were prepared incorporating the technology under study in each of the rehabilitative therapy sessions. There was a total of 18 sessions, with three sessions per week, each session including four rehabilitative exercises. This experimental regimen lasted for six consecutive weeks. After the completion of the rehabilitation program, the results were processed using SPSS software, version 28. The key conclusions and recommendations indicated that integrating rehabilitative exercises with the use of ultrasound is appropriate for therapeutic sessions for swimmers with shoulder impingement syndrome. The application of such exercises has a positive effect on restoring the range of motion in various directions of the shoulder joint for swimmers suffering from shoulder impingement syndrome. It is essential for hospitals to focus on developing the expertise of their therapists on how to implement rehabilitative exercises using ultrasound, based on the findings of this research, to effectively rehabilitate swimmers with shoulder impingement syndrome. The rehabilitation tools and methods should be tailored to the specific needs of swimmers with shoulder impingement syndrome and should be readily available in hospitals. Their use is essential when rehabilitating affected individuals. It is also crucial to leverage the expertise of academics specialized in sports rehabilitation when training hospital therapists, especially in light of the recent use of ultrasound technology. This requires ongoing collaboration between the Ministry of Health and Environment and colleges of physical education and sports sciences.

Keywords | **Rehabilitative exercises, Ultrasound, Range of motion, Shoulder impingement syndrome injury**

Introduction: The principle of accelerated recovery imposes on academic researchers the need to integrate rehabilitative exercises with various technological devices to form a single influential factor that relies on synchronized application. This approach takes into account the need to avoid exaggeration and prevent the exacerbation of injuries under medical

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supervision, as referenced in the study by Abdul-wahab et al., which states, "Rehabilitation prevents the long-term bed rest complications on bodily systems and facilitates faster healing, as it helps provide the appropriate environment and conditions" (9). Shoulder joint injuries, particularly those caused by overuse due to repetitive movements, are common and widespread across various sports and activities, especially in swimming. Swimmers are exposed to many sports injuries for various reasons in both training and competitive environments. One of the most common injuries is shoulder impingement syndrome and the associated pain. In some cases, this requires surgical interventions to repair tendon damage using specialized arthroscopic techniques. It is well-known that swimming performance heavily relies on the length and frequency of strokes, both of which are limited by the movement of the shoulder joint and other body parts' motion factors. In light of this, the researchers decided that it would be feasible to integrate ultrasound technology with rehabilitative exercises to apply them to swimmers suffering from shoulder impingement syndrome, adhering to the mentioned precautions and the scientific research constraints in avoiding personal assumptions and observing methodological procedures when addressing the dependent variables that indicate recovery from this injury. This includes especially the range of motion of shoulder movements in various directions, given the function of the joint. In light of this, the researchers concluded that it is possible to integrate ultrasound technology with rehabilitative exercises specifically designed for swimmers suffering from shoulder impingement syndrome. This approach adheres to established scientific research precautions that avoid personal conjectures and ensure methodological procedures are followed when dealing with dependent variables that signify recovery from this injury. This specifically includes the range of motion for shoulder movements in various directions, dictated by the function of the joint. Moreover, the approach also considers the neurological processes necessary to enable injured individuals to regain neuromuscular control, which can be compromised due to the functional impairment of the muscles surrounding the joint. The drive to break competitive swimming records across different swimmer categories sometimes pushes coaches to place training loads on swimmers that may exceed their biological capacities. This intense training can exert pressure on the muscular tissues and the tendons surrounding the joints that are most active or heavily utilized in performing the skills of this sport. Among these, the muscles working around the shoulder joint in swimming activities are particularly affected. The friction processes involved can lead to tendon damage characteristic of shoulder impingement syndrome. This condition typically manifests as pain when lifting the arm to the side, especially between 70 and 110 degrees, a position where the shoulder muscles rub against the acromion. Pain may increase as the arm is lifted beyond 110 degrees. It is essential to delve into understanding the anatomical locations and functional roles of these muscles for various movements. This knowledge forms a basis for directing the impact of rehabilitation devices or guiding the points of impact of rehabilitative exercises to suit the muscular activity for each muscle's function in swimming movements, whether they are acting, stabilizing, or assisting the shoulder joint in cases of impingement syndrome. The research seeks to find the easiest method and style for using rehabilitative exercises to alleviate the pain caused by this injury, to be implemented after improving the range of motion. Through field observations by the researchers of the rehabilitative exercises for treatment sessions for shoulders with impingement syndrome under the acromion in the bursa and rotator cuff tendons, it is noted that these sessions take a long time with traditional content, which causes swimmers to discontinue these rehabilitative sessions. The study by Warda and Rana suggests that "There is a significant necessity to use therapeutic and

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rehabilitative methods alongside rehabilitative exercises." (11). This has led to concerns about the worsening of injuries due to discontinuation of attendance, prompting them to adopt the principle of acceleration according to health conditions. They aim to contribute to the scientific efforts made by researchers to enhance the role of sports movements by integrating them with rehabilitation methods to achieve the desired goals and minimize these undesirable exacerbations and harm to swimmers. Therefore, the research aims to develop rehabilitative exercises accompanied by ultrasound to rehabilitate swimmers suffering from shoulder impingement syndrome and to explore the impact of these rehabilitative exercises using ultrasound in improving the range of motion for swimmers with shoulder impingement syndrome. The researchers hypothesized that there are statistically significant differences between the pre-test and post-test results of the rehabilitation of swimmers with shoulder impingement syndrome in favor of the post-test results for the experimental group.

Method and Procedures:

In response to the research problem, the experimental method was adopted using a single experimental group design with rigorous control, including pre-test and post-test assessments, as outlined by Musa and Ahmed (1). The study population was operationally defined as male swimmers suffering from Type I shoulder impingement syndrome from various local Iraqi clubs in Basra for the sports season 2022/2023. These individuals frequented the physical therapy department at Basra General Teaching Hospital, totaling nine affected swimmers. Specialized doctors diagnosed their condition and level of injury through clinical examination using Magnetic Resonance Imaging (MRI). The MRI scans revealed that they were at a moderate stage of damage to the muscles around the rotator cuff, characteristic of sub acromial impingement syndrome in the bursa and rotator cuff tendons. After excluding two individuals with complications from the study population, seven injured swimmers were deliberately chosen to represent the research sample, accounting for 77.78% of the total. The selected participants were confirmed through medical examinations to be free of complications or any other injuries. Additionally, to maintain the internal validity of the experimental design, it was essential to verify the homogeneity of the sample statistically regarding certain extraneous variables that could affect the outcomes of the dependent variable tests, as detailed in Table (1):

Table .1 shows the results of the homogeneity of the research sample in some extraneous variables

Extraneous Variables	Unit of Measurement	count	Arithmetic Mean	Standard Deviation	Skewness Coefficient	Variation coefficient
Body Mass Index (BMI)	kg/m^2	7	21.71	0.951	0.764	4.38 %
Chronological age	Year	7	25.86	0.9	0.353	3.48 %
Age of injury	Day	7	41.86	0.69	0.174	1.648 %
Type and severity of injury	Damage to the muscles around the rotator cuff of moderate severity and their progression to the physical therapy stage.					

(BMI) = Body weight (in kilograms) / (Height in meters) squared, with a coefficient of variation less than 39%.

Measurement and Procedures:

The researchers employed a goniometer to measure the range of motion of the shoulder joint in the following movements:

- Flexion of the shoulder.
- Extension of the shoulder.
- Horizontal abduction of the shoulder.
- Horizontal adduction of the shoulder.
- Internal rotation of the shoulder.

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The targeted muscles for rehabilitation were identified, requiring strengthening to improve the range of motion of the shoulder muscles. The approach took into consideration the nature of muscle function according to the principle of muscular synergy and the role of each muscle in being active, stabilizing, or antagonistic. These were incorporated into the design of rehabilitative exercises accompanied by technical devices for rehabilitation under study. The rehabilitative exercises using ultrasound were prepared by the researchers with minor modifications to some exercises to avoid putting pressure and heavy loading on the arm of the injured shoulder side, to prevent the recurrence of the syndrome. The exercises underwent specific methodological steps for approval and included a variety of exercises, both with and without equipment. This variety was designed to suit the capabilities of each injured swimmer individually, considering the differences in their abilities and resources, as follows:

- Stability and balance exercises.
- Stretching exercises to improve flexibility.
- Exercises to enhance balance and control.
- Pulling and bending exercises without resistance.
- Isometric strengthening exercises (exercises that do not change muscle length).
- Strengthening exercises with progressive resistance (weight training) using special resistances such as elastic bands in strengths (1, 2, 3), dumbbells (1 and 2 kg), a medicine ball weighing (2 kg), and light weights weighing (500 g) held by the arms (Appendix 1).

The difficulty of the rehabilitative exercises was adjusted according to the stages of progress in rehabilitation. At each stage, the difficulties were calibrated based on the maximum resistance a swimmer could handle while improving pain perception for strength and range of motion exercises. The difficulty of each rehabilitative exercise was determined using the Visual Analog Scale (V.A.S) according to the patient's tolerance (Appendix 2). A progression in performing rehabilitative exercises was adopted, moving from easy to difficult, from simple to complex, and from general to specific exercises in a logically sequential manner. Additionally, variation in the exercises was incorporated by distributing the point of impact across various active, stabilizing, and opposing muscles surrounding the shoulder joint. The fluctuation in the difficulty of rehabilitative exercises was also adopted, with varying levels of difficulty and ensuring adequate rest periods between exercises. The use of ultrasound therapy technology was an important part of the rehabilitation process for shoulder impingement syndrome. Using ultrasound waves before starting muscle strengthening exercises helped warm up the muscle tissues, making them more responsive to exercise, and increased blood flow to the affected area. This assisted in maintaining the range of motion and preventing muscle stiffness or worsening inflammation in the injury. This approach helps in assessing whether there is improvement and in adjusting the exercises and ultrasound therapy sessions according to the needs of each injured swimmer. These sessions were conducted under the supervision of physical therapists at Basra Teaching Hospital, who controlled the ultrasound technology device and adjusted the energy levels. Ultrasound devices typically operate at a frequency of 1 megahertz, although some devices function at varying frequencies ranging from 0.75 to 3 megahertz. It's important to note that higher frequencies do not penetrate tissues as deeply as lower frequencies. The frequencies used in physical therapy range between 0.5 and 5 megahertz. Ultrasound waves utilize a current with a frequency of one million cycles per second.

- The duration of the rehabilitative exercise program using ultrasound lasted for six consecutive weeks.
- Three rehabilitative sessions were conducted each week, spaced every other day.
- The total number of rehabilitative sessions using ultrasound amounted to 18 sessions,

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with the possibility of additional sessions as needed.

- The use of ultrasound in each session lasted between 6 to 10 minutes and occurred before the start of the rehabilitative exercises.
- A rest period of 5 consecutive minutes was provided to the injured individuals between the use of devices and the application of exercises in each therapy session.
- The duration of the rehabilitative exercises ranged from 18 to 22 minutes per session, with an average of 4 exercises per session. Some exercises and sessions were repeated based on the evaluation of the injured swimmer's condition and his need for recovery.

The pre-tests were administered to the seven injured swimmers in the experimental research group. The purpose of these tests was to establish baseline conditions for the experimental design in this study. These tests were conducted at 9:00 AM on Thursday, May 4, 2023, at Basra General Teaching Hospital. The statistical requirements necessitated that the data be quantitative and homogeneous, which led the researchers to verify the homogeneity of the scores of the dependent variables using the Levene's test for homogeneity of variance before starting the experiment, as detailed in the results of Table (2):

Table .2 illustrates the homogeneity of variance in the pre-test results of the dependent variables under investigation

Dependent Variable Tests		Unit of Measurement	Arithmetic Mean	Standard Deviation	(Liven)	(Sig)	Significance
Range of Motion (ROM) of the shoulder	Shoulder flexion	Degree	134	2.309	0.432	0.611	Not significant
	Shoulder extension	Degree	42	1.732	0.531	0.526	Not significant
	Horizontal abduction of the shoulder	Degree	65.71	2.928	0.244	0.742	Not significant
	Horizontal adduction of the shoulder	Degree	33.29	1.254	0.336	0.689	Not significant
	Internal rotation of the shoulder	Degree	43.57	1.397	0.416	0.502	Not significant
	External rotation of the shoulder	Degree	56.14	2.545	0.432	0.545	Not significant

Not significant: (Sig) > (0.05) at the significance level (0.05) and degrees of freedom (n - 1) = (6)

Subsequently, the rehabilitative exercises using ultrasound were applied to the seven injured swimmers in the experimental group, following the logical sequence of research procedures. The treatment was conducted at the physical therapy department of Basra General Teaching Hospital. The application of the treatment lasted for six consecutive weeks of rehabilitation. The implementation of this regimen started on Sunday, May 7, 2023, and continued until Thursday, June 15, 2023. After completion, the same tests were administered under the conditions identical to the pre-tests on Sunday, June 18, 2023. Data from these post-test measurements of the dependent variables were recorded on specialized paper forms for later statistical processing. The researchers used the Statistical Package for the Social Sciences (SPSS), version 28, to analyze the data. They automatically extracted statistical metrics including percentages, mean, standard deviation, skewness, coefficient of variation, Levene's test for homogeneity of variances, and the paired sample t-test.

Results:

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Table .3 shows the results of the range of motion tests for the anterior and posterior shoulder joint for the experimental research group

Test and measurement unit		Comparison	Arithmetic Mean	Standard deviation	Mean difference	Difference deviation	(t)	(Sig)	Significance of the Difference
Range of motion of the shoulder (measured using a goniometer)	Shoulder flexion (degrees)	Pre-test	134	2.309	27	3.367	21.219	0.000	Significant
		Post-test	161	1.414					
	Shoulder extension (degrees)	Pre-test	42	1.732	11.143	2.61	11.298	0.000	Significant
		Post-test	53.14	1.574					
	Horizontal abduction of the shoulder (degrees)	Pre-test	65.71	2.928	18.714	3.039	16.29	0.000	Significant
		Post-test	84.43	0.535					
	Horizontal adduction of the shoulder (degrees)	Pre-test	33.29	1.254	11	1.633	17.822	0.000	Significant
		Post-test	44.29	0.488					
	Internal rotation of the shoulder (degrees)	Pre-test	43.57	1.397	11.429	1.813	16.681	0.000	Significant
		Post-test	55	0.816					
	External rotation of the shoulder (degrees)	Pre-test	56.14	2.545	18.571	2.699	18.204	0.000	Significant
		Post-test	74.71	0.488					

The statistical difference is significant if (Sig) > 0.05 at a significance level of 0.05 and degrees of freedom (n) - 6 = 1

Discussion:

The results shown in Table (3) indicate that the injured swimmers experienced improvements in the angular range of motion values for the shoulder joint in all five directions in the post-tests compared to what these values were in the pre-tests. These improvements were confirmed by the matching results of the pre-test and post-test for the flexibility of the shoulder joint and the range of motion of the shoulder girdle. The researchers attribute these outcomes to the effective alignment between warming up and treating muscle pain through ultrasound therapy rehabilitation combined with rehabilitative exercises. These exercises focused on muscle elongation using various resistances tailored to each stretching exercise. Careful precautions were taken in determining the difficulty level of each exercise based on the pain level experienced during each stage of rehabilitation. The researcher focused on designing and applying the rehabilitative exercise content to achieve multiple physical objectives in a single application, without complications or exaggerations in the levels of movement ranges appropriate for the abilities of swimmers affected by this syndrome.

The study by Alaa and Suad noted that "using appropriate rehabilitation or treatment and before starting any rehabilitation program, it is essential to assess the injured part both functionally and anatomically, identify the degree of injury, so that an appropriate rehabilitation program can be devised to achieve the desired outcome. Rehabilitative exercises play a crucial role as they are key in returning the injured part to its normal state" (4).

Yamada, et al. also pointed out that "rehabilitative exercises, when applied continuously without breaks, can increase the elasticity of the muscles to the desired levels if the stretching is

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accompanied by resistances not exceeding (50%) of the patient's capacity, with strict precautions during muscle elongation and under medical supervision to avoid exacerbating the injury of the joint tendons, which are an aggregate of muscle fiber membranes" (12).

Hall mentioned that "moving the joint freely within its natural range affects joint stability through the cohesion of the articular bone ends with one another, as ligaments and strong muscles enhance the stability and strength of the joint" (8).

The researchers attribute the results of these developments in the range of motion variables shown in the table to the integration of exercises and rehabilitation tools aimed at stimulating the healing process. This integration increased blood flow to the injured shoulder joint muscles, leading to tissue strengthening and stimulation of new cell growth contributing to recovery. It also promoted the inflammatory response, which helps remove waste and reduce pressure on damaged tissues, and increased the tissue flexibility level. This enhanced the natural movement of the muscles, tendons, and surrounding tissues of the shoulder joint. Continuously applying these assisted methods in the rehabilitative sessions, which targeted the muscular strength development of the muscles working on the shoulder joint for six consecutive weeks with three sessions per week, allowed the muscles subjected to stretching in these varied exercises to rest from the challenges they faced.

Padulo noted that "light strength exercises achieve commendable results in developing the strength of damaged muscles without overstraining them, which helps improve the range of motion" (10).

Yousef also pointed out that "injuries common in the sports field generally, and particularly in swimming, occur significantly when the joint is subjected to unusual force or a direct hit that pushes the joint beyond its natural limits, leading to varying degrees of ligament injuries" (13).

Abdul Hassan's study pointed out that "there are several objectives of rehabilitation including the restoration, enhancement, and development of physical fitness components to align with the nature of the activity practiced and to benefit from the passive recovery phase" (6).

The researchers also attribute the emergence of these developments in the motor variables and shoulder muscle flexibility of swimmers in the experimental group to regulating the difficulty of each rehabilitative exercise according to the level of pain experienced during its execution, based on the movements of the rehabilitation session exercises, and ensuring compliance with tracking the condition of each muscle stretching involved in each of these exercises. Considering that flexibility depends primarily on the elasticity of the muscles surrounding the shoulder joint, investing in applying resistances tailored to each range of motion in these rehabilitative exercises proved effective in achieving the closest possible symmetry in recovery. As Shafie pointed out, "Ligaments, muscles, and their tendons affect joint stability through the cohesion of the ends of the joint bones with each other. Strong ligaments and muscles increase joint stability and strength" (3).

Additionally, Al-Madamegha noted that "Muscular flexibility is an important characteristic in activities requiring a wide range of motion for the performance of sports skills, and the presence of this characteristic ensures the success of skill performance to a great extent" (2). Furthermore, a study by Atwan highlighted that "Physical therapy holds particular importance in the field of rehabilitation in its final stages, preparing the injured individual for recovery" (7). As highlighted by the study conducted by Ali and Luay, "The progression in exercises and their diversity from simple to difficult, and repetitions, ensure muscle dynamics during the application of the rehabilitation program" (5). Additionally, a study by Ruaa and Abeer pointed out that "It is essential for rehabilitation tools and methods to be tailored to the specific needs of the patients, the type of rehabilitation exercises, and their availability in hospitals, with a necessary need for them in the rehabilitation process" (14). Furthermore, a study by Sabaa et al. concurred that

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"Rehabilitation exercises designed by researchers have a positive impact on improving muscle strength and reducing pain intensity among the research sample individuals" (15).

Conclusions:

1. Integrating rehabilitative exercises with the use of ultrasound is suitable for therapeutic sessions for swimmers suffering from shoulder impingement syndrome.
2. The application of rehabilitative exercises using ultrasound has a positive effect on restoring the range of motion in various directions of the shoulder joint for swimmers afflicted with shoulder impingement syndrome.

Recommendations:

1. It is essential that hospitals focus on developing the expertise of their therapists on how to implement rehabilitative exercises using ultrasound, based on the findings of the current research for rehabilitating swimmers with shoulder impingement syndrome.
2. It is crucial that the rehabilitation tools and methods are tailored to the specific needs of swimmers with shoulder impingement syndrome and that these tools are readily available in hospitals. Their availability should be considered essential for the rehabilitation of injured individuals.
3. There must be a focus on leveraging the expertise of academics specialized in sports rehabilitation when training hospital therapists. This should align with the novelty of using ultrasound techniques and involve a continuous collaboration mechanism between the Ministry of Health and Environment and colleges of physical education and sports sciences.

Author's declaration:

Conflicts of interest: None

We confirm that all tables and figures in this article are ours and written by the researchers themselves.

Ethical-Clearance: this manuscript approved by local ethical committee of physical education and sport sciences college for women on (January /2023)

Author's contributions:

All contributions of this study were done by the researchers (N.H. and S.H.) who get the main idea and work on writing and concluding also with number of experts, Alaa fleih Jawad in Statistics, Huda Shihab in revision, Inaam Ghalib in translating, Mazin Hadi in proofreading

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References:

1. Musa, Abdul Salam and Ahmed, Nawaf (2020). Concepts and Terminology in Educational Sciences, 3rd Edition: Amman, Dar Al-Masirah for Publishing and Distribution.
2. Al-Madamegha, Mohammad Ridha Ibraheem. (2008). The Field Application of Theories and Methods of Sports Training, Iraq, Baghdad, Al-Fadhli Library, pp. 218-219
3. Shafie, Yasser Saeed. (1993). Rehabilitation of the Knee Joint After Surgical Repair of Anterior Cruciate Ligament Injury, unpublished doctoral dissertation, Faculty of Physical Education for Boys, Helwan University.
4. Alaa Wissam, & Abd Hussain, S. (2022). Effect of constant stretching exercises in improving the elasticity of cervical vertebrae for patients with cervical spondylitis's for ages (40-50) years. *Modern Sport*, *21*(1), 0075. https://doi.org/10.54702/msj.2022.21.1.0075
5. Luay Sami & Ali Abdul Kadhim (2019). Effect of rehabilitation exercises in low back flexibility and muscle strength working for men by age (40-45) years. *Journal of Physical Education*, *31*(1), 105-

P-ISSN: 1992-0091
E-ISSN: 2708-3454

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Published 30/06/2024 Open Access

120. https://doi.org/10.37359/JOPE.V31(1)2019.818

6. Abdul Hassan, A. D. (2017). The Effect of Rehabilitation Exercises and Laser Therapy Technology on the strength and flexibility of the spinal muscles of women with disc, *Modern Sport*, *16*(3), 15. https://jcopew.uobaghdad.edu.iq/index.php/sport/article/view/38/34
7. Atwan, D.A. (2018). The effect of static stretching exercises in improving the strength of the muscles working on the cervical vertebrae for patients with osteoarthritis aged 40-50 years. *Modern Sport*, *17*(1). https://jcopew.uobaghdad.edu.iq/index.php/sport/article/view/7
8. Hall, S. J. (2014). Biomechanics basics. Translated by (Hassan Hadi and others). I1. Baghdad. Sports Library for Publishing and Distribution.
9. Abdul-wahab, S., Abdul-Munim, D., Mubarak, H. A. F. (2019). The Effect of Using Rehabilitative Exercises to Increase the Flexibility of Wrist Joint for Junior Boxing Players. *Modern Sport*, *18*(1). https://jcopew.uobaghdad.edu.iq/index.php/sport/article/view/1054
10. Padulo, Johnny, et al. (2016). Effects of neuromuscular training on the reaction time and electromechanical delay of the peroneus longus muscle. Journal of Strength and Conditioning Research 30.12: 3464-3471.
11. Warda Ali, & Rana Qais. (2020). Effect of therapeutic methods and exercises for the rehabilitation of low lumbar herniated disc in the infected (30-40) years. *Modern Sport*, *19*(2), 0001. https://doi.org/10.54702/msj.2020.19.2.0001
12. Yamada, Minoru, et al. (2018). Effects of muscle strengthening exercise and dietary guidance on motor function and muscle strength in frail elderly people: a randomized controlled trial. Physical Therapy 98.3, 195-204.
13. Youssef, Mervat El-Sayed (2011). Sports Medicine Problems, Third Edition, Al-Shanhabi Company for Printing and Publishing, Alexandria.
14. Ruaa Akram Al-Hijazi, & Abeer Dakhil. (2021). The effect of rehabilitative exercises associated with the technique of Chiropractic in relieving the pain of muscle stretching in the lower back of people with a herniated disc. *Modern Sport*, *20*(2), 0023. https://doi.org/10.54702/msj.2021.20.2.0023
15. Sabaa Basim Mohammed, Suhad Haseeb Abdul-hameed, & Ibrahim Dabayebeh. (2023). The effect of rehabilitation exercises in improving the muscle strength of those with a partial tear in the posterior thigh muscle for Karbala football club players. *Modern Sport*, *22*(4), 0049–0059. https://doi.org/10.54702/ms.v22i4.1172

Appendix (1)
A model for a rehabilitation session

Second week: Session six
Objective of the rehabilitation program: Rehabilitation of shoulder impingement syndrome
First: Rehabilitation with ultrasound therapy technology for (8) minutes for each of the shoulder muscles
Secondly: Rest between using devices and exercises for (5) minutes
Third: Rehabilitation exercises

Rehabilitation exercise number	Performance time and stability	Number of repetitions	Rest between repetitions	Groups	Rest between sets

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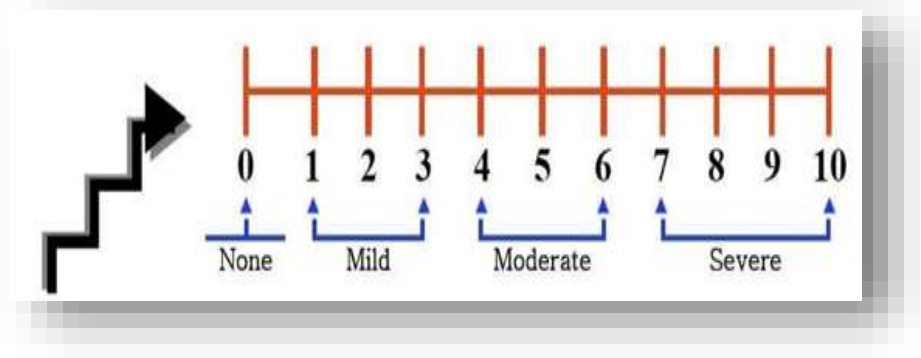
1	5 Sec	10	10 Sec	1	2 min
2	4 Sec	10	10 Sec	2	1 min
3	5 Sec	10	10 Sec	1	2 min
4	4 Sec	10	10 Sec	2	1 min

1. From a standing position, use the arm of the unaffected shoulder to pull the arm of the affected shoulder upwards from behind the back using a non-elastic fabric (medical brace). Alternate between both arms for pulling.
2. From a standing position, pull the resistance band upwards (level 2) from in front of the chest and beside the torso using the arms of both the affected and unaffected shoulders while keeping both arms straight.
3. From a standing position, flex and extend the arms of both the affected and unaffected shoulders, raising a 5 kg iron bar from behind the shoulder to behind the top of the head.
4. From a half-sitting position with knees bent, pull the resistance band upwards (level 2) from in front of the chest and beside the torso using the arms of both the affected and unaffected shoulder while keeping both arms straight.

Appendix (2)
shows a diagram for measuring the pain scale V.A.S (Visual Analog Scale)



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تأثير تمرينات تأهيلية بمصاحبة الأمواج فوق الصوتية في تحسين المديات الحركية للسباحين المصابين بمتلازمة إنحشار الكتف

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مستخلص البحث

هدف البحث إلى إعداد تمرينات تأهيلية بأستخدام الأمواج فوق الصوتية لتأهيل السباحين المصابين بمتلازمة إنحشار الكتف، والتعرف على تأثير التمرينات التأهيلية بأستخدام الأمواج فوق الصوتية في تحسين المدى الحركي للسباحين المصابين بمتلازمة إنحشار الكتف، وأفترضت الباحثتان بأنه توجد فروق ذات دلاله احصائية بين نتائج اختبارات تأهيل السباحين المصابين بمتلازمة إنحشار الكتف القبلية والبعدية لمجموعة البحث التجريبية ولصالح الاختبارات البعدية، واعتمد المنهج التجريبي على عينة من السباحين المصابين بمتلازمة إنحشار الكتف البالغ عددهم (7) مصابين يمثلون ما نسبته (77.78%) من مجتمعهم المتمثل بالسباحين الذكور المصابين بمتلازمة إنحشار الكتف من النوع الأول من مختلف الأندية العراقية المحلية في محافظة البصرة للموسوم الرياضي (2023/2022)، والذين يرتادون إلى شعبة العلاج الطبيعي في مشفى البصرة العام التعليمي، وبعد التشخيص وتحديد الاختبارات واعداد التمرينات بالدمج مع التقنية قيد البحث في كل من الجلسات العلاجية التأهيلية البالغ عددها (18) جلسة بواقع (3) جلسات تحوي كل منها (4) تمرينات تأهيلية تم التجريب لمدة (6) اسابيع متتالية وبعد الانتهاء تمت معالجة النتائج بنظام**SPSS** الإصدار**V28** وكانت أهم الاستنتاجات بأنه والتوصيات بأن دمج تمرينات تأهيلية مع أستخدام الأمواج فوق الصوتية ملائمة للجلسات العلاجية للسباحين المصابين بمتلازمة إنحشار الكتف، ولتطبيقها تأثير إيجابي في أستعادة المديات الحركية لمفصل الكتف في مختلف الإتجاهات لدى السباحين المصابين بمتلازمة إنحشار الكتف، ومن الضروري أن تهتم المستشفيات بتطوير خبرات المعالجين العاملين فيها عن كيفية تطبيق التمرينات التأهيلية بأستخدام الأمواج أستناداً إلى ما توصل إليه البحث الحالي من نتائج لتأهيل السباحين المصابين بمتلازمة إنحشار الكتف، وأن تلائم الأدوات والوسائل التأهيلية خصوصية السباحين المصابين بمتلازمة إنحشار الكتف وإمكانية توفيرها في المستشفيات، وأن تكون الحاجة إليها ضرورية عند تأهيل المصابين، ولابد من الإهتمام باستثمار خبرات الأكاديميين المتخصصين في التأهيل الرياضي عند تدريب المعالجين العاملين في المستشفيات بما يلائم حداثة أستخدام الأمواج فوق الصوتية باعتماد الية تعاون مستمرة بين وزارة الصحة والبيئة وكليات التربية البدنية وعلوم الرياضة.

الكلمات المفتاحية | **تمرينات تأهيلية، الأمواج فوق الصوتية، المديات الحركية، أصابة متلازمة إنحشار الكتف.**